

NEW GENERA AND SPECIES OF DEEP-SEA
POLYCHAETES OF THE FAMILY NAUTILINIELLIDAE
FROM THE GULF OF MEXICO AND THE
EASTERN PACIFIC

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Abstract.—Three new genera and species of deep-sea polychaetes are described. *Pilargis mirasetis* Fauchald, 1972 is redescribed and referred to a new genus *Santelma*. These species are tentatively referred to the family Nautiliniellidae that heretofore has included commensals of bivalve molluscs. One species, *Laubierus mucronatus*, was dissected from a mussel during its collection, but the other three species were not associated with bivalves during the sample sorting process. Two genera and species, *Miura spinosa* and *Santelma mirasetis* come from the eastern Pacific, while *Laubierus mucronatus* and *Flascarpia alvinae* come from cold-seep communities on the Florida Escarpment. The genera presently assigned to the Nautiliniellidae are heterogeneous and diverse. These genera are compared with previously described nautiliniellids and with the closely related family Antonbrunnidae.

The nautiliniellids are a small group of polychaetes that live as commensals or parasites of deep-sea bivalve molluscs. Although only first reported in 1989, six species have already been described (Miura & Laubier 1989, 1990; Blake 1990; Miura & Ohta 1991), and there are probably many additional species awaiting discovery. Individual species tend to be small and have probably been overlooked by biologists owing to their association with molluscs. The morphology of the prostomium and the types of setae have proven to be quite variable and the status of this new group is not fully understood.

Four additional genera and species of this family have been discovered from North America. One species comes from mussels at cold-seep sites on the Florida Escarpment and is assigned to a new genus *Laubierus*. Another Florida Escarpment species is assigned to a new genus *Flascarpia*. A third species has been identified from a low oxygen site in the Santa Maria Basin off central California, and is assigned to a new genus

Miura. A fourth species from deep-water off Western Mexico and previously described as *Pilargis mirasetis* by Fauchald (1972) is redescribed and assigned to a new genus *Santelma*.

The types of the new species are deposited in the collections of the National Museum of Natural History (USNM), Smithsonian Institution, Washington, D.C.

Systematic Account

Family Nautiliniellidae Miura & Laubier

Diagnosis.—Bodies elongate, cylindrical, and smooth. Prostomium variable, with 1–2 pairs of antennae, medial antenna or papilla present or absent, or antennae entirely absent; eyes absent; palps lacking. Foregut expanded into a muscular pharynx, termed a proventriculus (Miura & Laubier 1989, 1990); this pharynx partially eversible (Blake 1990, this paper). Peristomial segment well developed with distinct tentacular cirri present in two genera (*Santelma* and *Flascarpia*), reduced in three genera (*Petrecca*,

Laubierus, and *Miura*), and lacking in three other genera (*Nautiliniella*, *Shinkai*, and *Natsushima*). Parapodia subbiramous to sesquiramous, with reduced notopodia, usually with acicula; neuropodia with internal aciculae and one to several simple hooked spines. Pygidium simple, lacking appendages.

Miura, new genus

Type species.—*Miura spinosa*, new species. Gender feminine.

Diagnosis.—Body, widest anteriorly, tapering posteriorly. Prostomium rounded; antennae and eyes lacking. Pharynx weakly muscularized, prominent in first 3 segments. Peristomial segment achaetous, smaller than following setigers; with 2 pair of short lobes present. Parapodia sesquiramous, with thick notopodial lobe, acicula not observed; neuropodium with fascicle of 5–6 simple hooks, with single acicula, sometimes with tip protruding; ventral cirrus present. Pygidium unknown.

Etymology.—This genus is named for Dr. Tomoyuki Miura, who was one of the first describers of the nautiliniellid polychaetes.

Remarks.—This genus differs from previously described nautiliniellids by lacking antennae altogether and in having sesquiramous parapodia where the notopodial lobes are large and thick, but apparently lacking aciculae. Like *Petrecca*, *Miura* has a reduced and achaetous tentacular segment; like *Shinkai* it has several neuropodial spines instead of one. A single species, *Miura spinosa*, is known.

Miura spinosa, new species

Fig. 1

Material examined.—California: Santa Maria Basin, Sta. R-7, 34°52.90'N, 121°10.30'W, May 1989, 565 m, holotype (USNM 148677).

Description.—A small species, holotype an anterior fragment measuring 1.5 mm

long, 0.7 mm wide for 10 setigers. Color in alcohol: light tan with scattered orange pigment spots on dorsal and ventral surfaces. Body subcylindrical to oval in cross section, widest through first 6–7 setigers, then tapering posteriorly.

Prostomium twice as wide as long, broadly rounded anteriorly (Fig. 1A); antennae and eyes absent. Mouth with broad ventral lip (Fig. 1B); pharynx weakly muscularized, prominent in first 3 segments (Fig. 1A). Peristomial segment achaetous, smaller than following setigers, with 2 pairs of small stubby lateral lobes. Parapodia sesquiramous, with thick notopodial lobe lacking acicula (Fig. 1C); neuropodium with fascicle of 4–6 simple hooks; each hook sharply pointed, with subapical notch and boss (Fig. 1D); acicula present, distal end slightly protruding on some setigers; ventral cirrus thick, rounded lobe. Pygidium unknown.

Biology.—*Miura spinosa* was collected at a depth of 565 m in a sea valley in the Santa Maria Basin that has very fine silty sediments with high clay content. This depth is also characterized by low dissolved oxygen concentrations ($\bar{X} = 0.898$ ml/l, $SD = \pm 0.152$; $n = 4$) in the near-bottom water. It is not known if hydrogen sulphide or methane is also present at this site. This specimen was not associated with a bivalve during the sorting process, but may have been washed from a host animal during processing.

Etymology.—The specific name refers to the neuropodial spines.

Remarks.—The shape of the setae of *Miura spinosa* is similar to *Pilargis mirasetis*, with which this species was identified in the MMS monitoring program where it was collected. *Pilargis mirasetis* has also been found to be a species of Nautiliniellidae and has been referred to a new genus, *Santelma* (see below). *Santelma mirasetis* differs from *Miura spinosa* in having short notopodial lobes instead of ones that are large and thick, in having long protruding

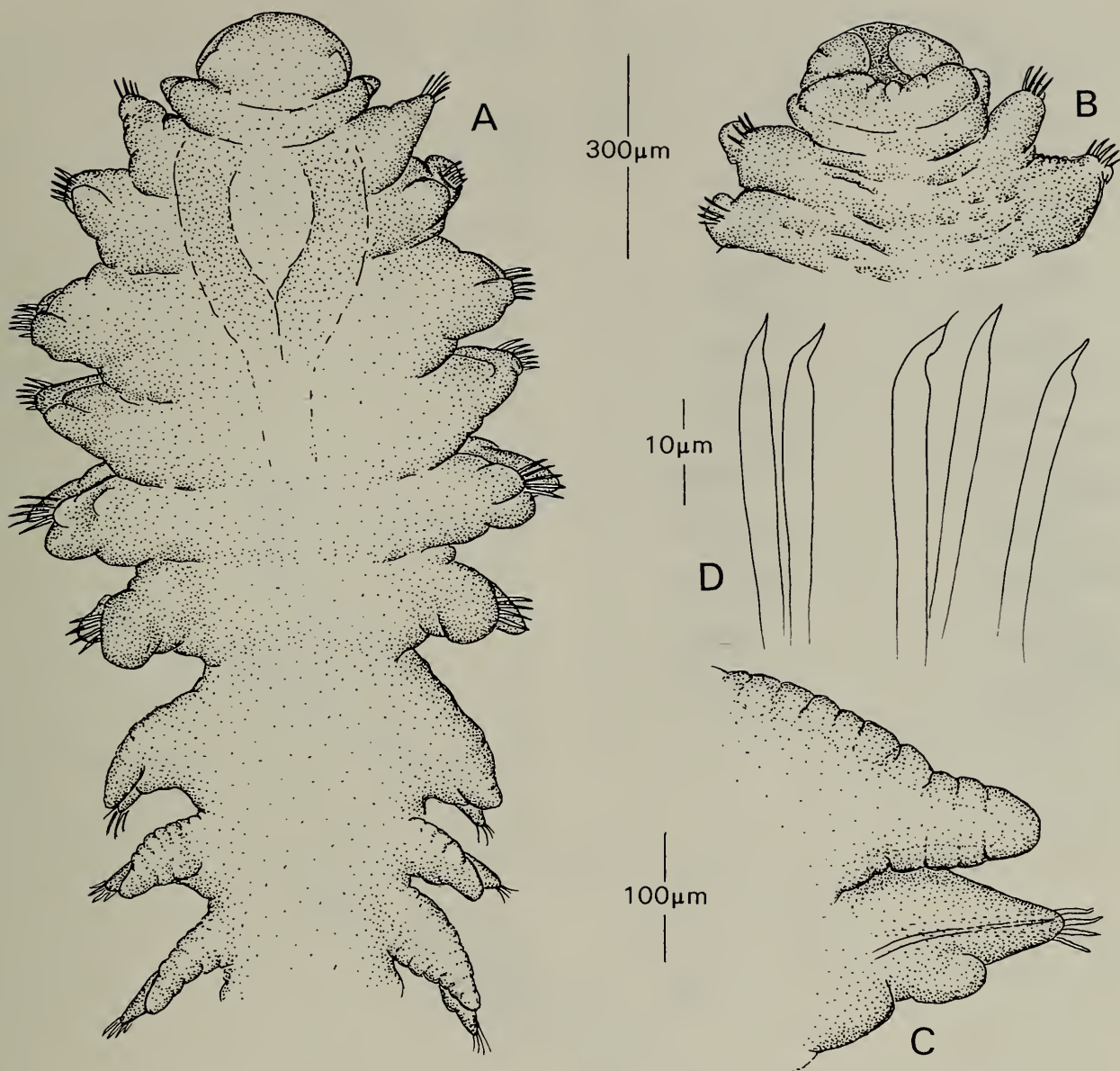


Fig. 1. *Miura spinosa* (USNM 148677). A, anterior end, dorsal view; B, anterior end ventral view; C, tenth parapodium; D, neurosetae.

aciculae instead of lacking these spines, and in having two distinct tentacular cirri instead of two pair of short, stubby lobes.

Distribution.—California, upper continental slope, 565 m.

Genus *Santelma*, new genus

Type species.—*Santelma miraseta* (Fau-chald, 1972). Gender feminine.

Diagnosis.—Body dorsoventrally flattened. Prostomium rounded anteriorly, bearing 2 lateral and 1 medial antenna or

papilla (scar only present on *S. miraseta*); eyes and palps absent. Pharynx enlarged, muscular. Peristomial segment achaetous, bearing 2 pair of tentacular cirri. Parapodia sesquiramous, with prominent notopodial lobe bearing large internal acicula; neuropodium with single large acicular protruding acicula and fascicle of numerous, small, simple setae; dorsal and ventral cirri absent; branchiae absent. Pygidium a simple rounded lobe.

Etymology.—The name for this genus is coined from the town of San Telmo, Mex-

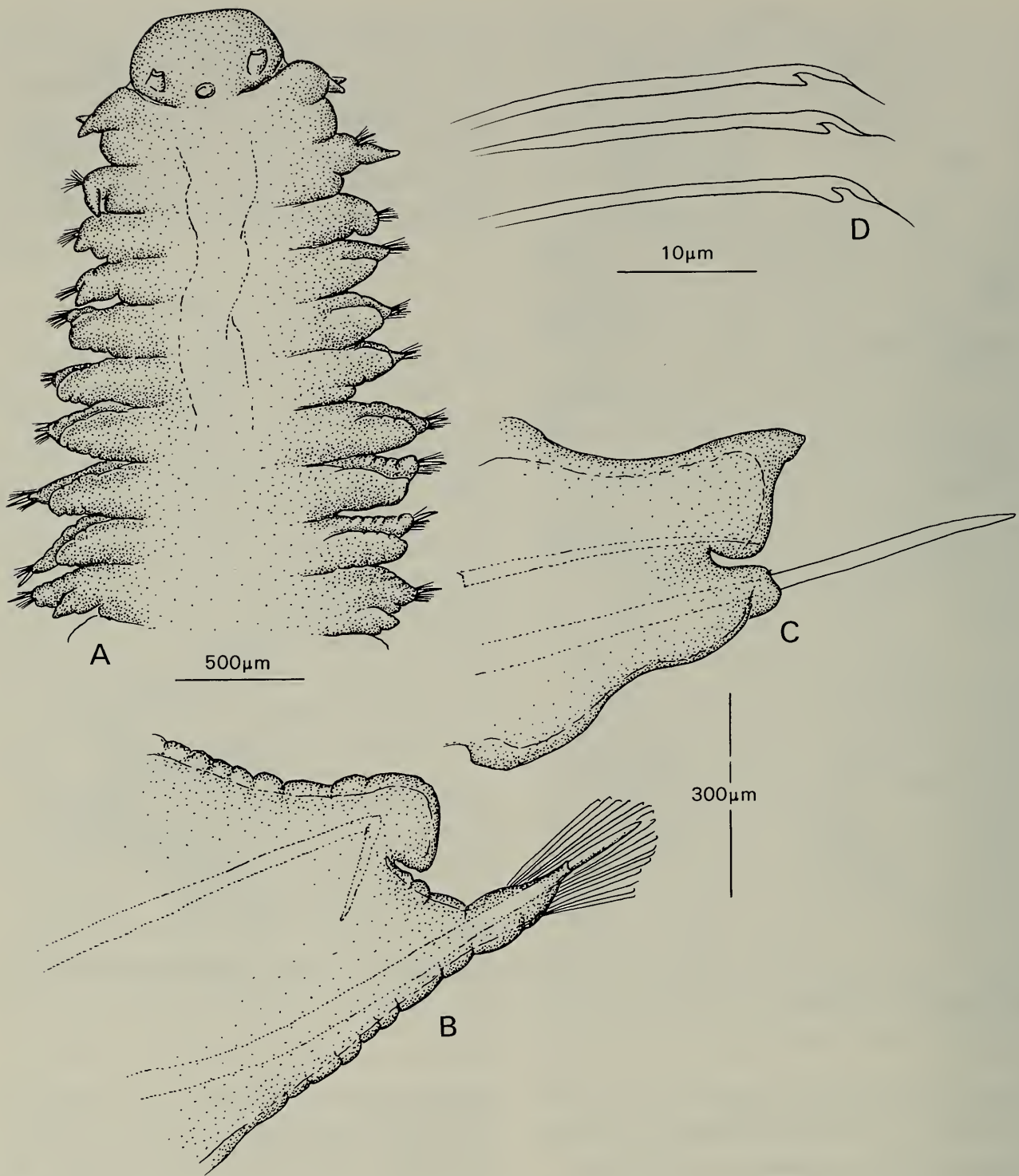


Fig. 2. *Santelma miraseta* (LACM-AHF 097). A, anterior end, dorsal view; B, eighth parapodium; C, middle parapodium; D, neurosetae from an anterior setiger.

ico, which is the closest point of land near the collecting site of *Santelma miraseta*.

Remarks.—The presence of two antennae and a third median antenna or papilla distinguishes *Santelma* from other genera in the nautiliniellid complex. The four small tentacular cirri and large, protruding neuropodial acicula are also unusual.

Santelma miraseta (Fauchald, 1972),
new combination
Fig. 2

Pilargis mirasetis Fauchald, 1972:59–60, pl. 8, figs. a–c.—Salazar-Vallejo, 1986:200, pl. 2, figs. 9–10.

Material examined.—Off San Telmo,

Mexico, *Velero* IV Sta. 13744-70, 15 Jan 1970, 18°12'00"N, 104°00'00"W, 2340 m, holotype (LACM-AHF 097).

Description.—Holotype complete, only known specimen, 25 mm long, 2 mm wide, with about 110 segments. Color in alcohol: tan. Body generally robust, dorsoventrally compressed, elongate.

Prostomium wider than long, broadly rounded on anterior margin; with 2 lateral antennae (bases only) and single median antenna or papilla (scar only), all located near border of prostomium and peristomial segment (Fig. 2A); palps and eyes absent. Pharynx muscular, not everted. Peristomial segment slightly larger than following segment, bearing 2 pair of short, tapering tentacular cirri (Fig. 2A).

Parapodia sesquiramous, with notopodium formed into thickened lobe, distally prolonged in middle and posterior segments; notopodia bearing large internal acicula, typically bending sharply near tip (Fig. 2B); dorsal cirrus absent. Neuropodium with large protruding acicula and fascicle of 18–25 simple bidentate setae (Fig. 2B); ventral cirrus absent. Setae bidentate, tapering apically to fine, mucronate tip; subapical tooth blunt (Fig. 2D); bidentate setae mostly lost in middle and posterior parapodia, leaving only protruding spine (Fig. 2C). Pygidium simple, rounded lobe; without cirri.

Remarks.—*Santelma miraseta* is here removed from the Pilargidae because palps are absent. However, the referral of this genus and species to the Nautiliniellidae is preliminary pending further review of the family. The presence of a medial antenna or papilla is new to species of the nautiliniellid-complex of genera. The very large and conspicuous protruding neuropodial acicula was not mentioned by Fauchald (1972). This acicula accompanies a cluster of very minute bidentate setae in anterior setigers. In posterior setigers, the bidentate setae are absent and the protruding acicula is the only visible seta and provides this species with a distinct posterior armature.

Two types of emergent neurosetae have also been reported for *Natsushima* and *Laubierus*, but these genera are very distinct from *Santelma* (see Discussion for overall summary).

Laubierus, new genus

Type species.—*Laubierus mucronatus*, new species. Gender masculine.

Diagnosis.—Body dorsoventrally flattened, ribbonlike. Prostomium rounded anteriorly, bearing a single pair of antennae; eyes lacking. Pharynx muscularized, forming distinctive proventriculus. Achaetous peristomial segment present, bearing pair of short cirri homologous to normal ventral cirrus. Parapodia sesquiramous, with aciculae in both noto- and neuropodia; setal fascicles limited to neuropodia; including large and small types of simple setae. Ventral cirrus present. Pygidium a simple lobe.

Etymology.—This genus is named for Dr. Lucien Laubier, polychaete systematist, in recognition of his first descriptions of nautiliniellids.

Remarks.—The appearance of the pharynx resembles the proventriculus that has been reported for the Japanese genera and species. The presence of large and small simple spines in the neuropodia of *Laubierus* is similar to that of the genus *Natsushima* Miura & Laubier. In comparing these genera, *Laubierus* has an achaetous peristomial segment, large notopodial acicula, and small simple neurosetae, whereas *Natsushima* has no peristomial segment, thin notopodial acicula, and small bifid neurosetae.

Laubierus mucronatus, new species

Fig. 3

Material examined.—Florida Escarpment, *Alvin* Dive 1756, 26°01'N, 84°55'W, 3243 m, 17 Oct 1986, R. Lutz and G. Tien, observers, dissected from mussel, 1 fragment (JAB); *Alvin* Dive 1758, 26°01.8'N, 84°54.9'W, 3266 m, Oct 1986, C. Wirsen and B. Tilbrook, observers, holotype (USNM 148678).

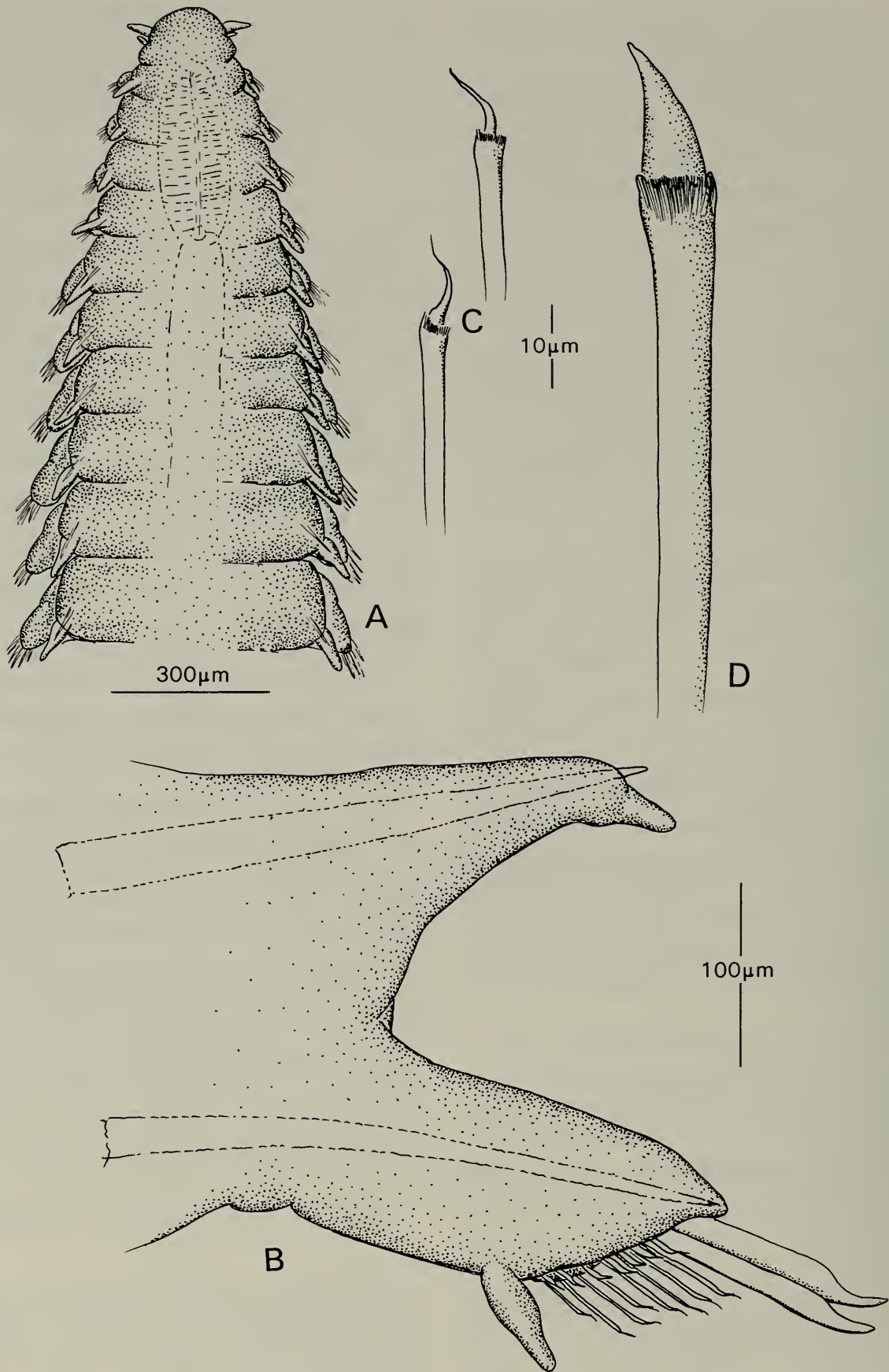


Fig. 3. *Laubierus mucronatus* (USNM 148678). A, anterior end, dorsal view; B, middle parapodium; C, small neurosetae; D, large neuroseta.

Description.—A small species, holotype complete, 5 mm long and 0.4 mm wide for 34 setigerous segments; fragment larger, but anteriorly incomplete. Color in alcohol: opaque white. Body elongate, dorsoventrally flattened, tapering gradually anteriorly and posteriorly.

Prostomium wider than long, rounded along anterior margin, bearing single pair of sublateral antennae (Fig. 3A); tentacular segment poorly developed, only vaguely separated from prostomium, bearing pair of short cirri. Anterior part of digestive tract modified into proventriculus, with distinct musculature apparent through body wall (Fig. 3A).

Parapodia sesquiramous, with notopodia bearing only a single, large acicula, with tip sometimes protruding; notopodium elongate, tapering, extended apically into narrow lobe (Fig. 3B). Neuropodia longer, broader than notopodium, with fingerlike ventral cirrus; bearing large internal acicula and 2 types of simple neurosetae; 1 type small, numbering 15–20 in 2 rows; each with fringed tip from which tapering mucronate tip emerges (Fig. 3C); second type 1–2 large, falcate hooks, with each bearing delicate subapical fringe of fine bristles (Fig. 3D). Pygidium a simple lobe, lacking cirri.

Etymology.—The specific name comes from the latin, mucros, referring to the fine, tapering point of the smaller neurosetae that characterize this species.

Genus *Flascarpia*, new genus

Type species.—*Flascarpia alvinae*, new species. Gender feminine.

Diagnosis.—Body elongate, compressed, ventrum flattened, dorsum rounded. Prostomium with broadly rounded anterior margin, lacking eyes, with 2 lateral antennae. Distinct peristomial segment, bearing a pair of tentacular cirri. Pharynx soft, ever-sible. Parapodia sesquiramous, with notopodial lobe containing blood loop and apparently functioning as gill; acicula absent.

Neuropodium well-developed, with large acicula and fascicle of large simple neurosetae of 1 type; ventral cirrus present. Pygidium a simple lobe, lacking cirri.

Etymology.—The generic name is a composite of Florida and Escarpment, denoting the Florida Escarpment where the type species was collected.

Remarks.—The notopodium lacks all setae, including the acicula, and by having a blood loop, apparently functions as a gill. *Flascarpia* and *Miura* are the only nautiliniellid-like genera known to lack notoaciculae and to have the notopodium modified into a soft, fleshy lobe. In *Flascarpia*, a distinct blood loop is present, suggesting that it functions as a gill. In *Miura*, no blood loop was observed. The relationships of *Flascarpia* with all of the nautiliniellid-like genera are compared in the Discussion (see below).

Flascarpia alvinae, new species

Fig. 4

Material examined.—Florida Escarpment, *Alvin Dive* 1754, 26°02.4'N, 84°55.3'W, 3303 m, 15 Oct 1986, R. Carney and B. Hecker, observers, holotype (USNM 148679).

Description.—A moderate-sized species, holotype complete with 66 segments, measuring 21 mm long; 1 mm wide anteriorly, 2 mm wide in middle. Body widest in middle of body, tapering anteriorly and posteriorly; body flattened ventrally, rounded dorsally. Pygidium a simple lobe lacking cirri. Color in alcohol: tan.

Prostomium wider than long, broadly rounded on anterior margin; with 2 short antennae on lateral anterior margins of prostomium (Fig. 4A). Peristomial segment present, not distinctly separated from prostomium, bearing a single pair of long, fingerlike tentacular cirri (Fig. 4A). Parapodia sesquiramous, with notopodium reduced to soft lobe bearing internal blood vessel (Fig. 4B); acicula absent. Neuropodium elongate,

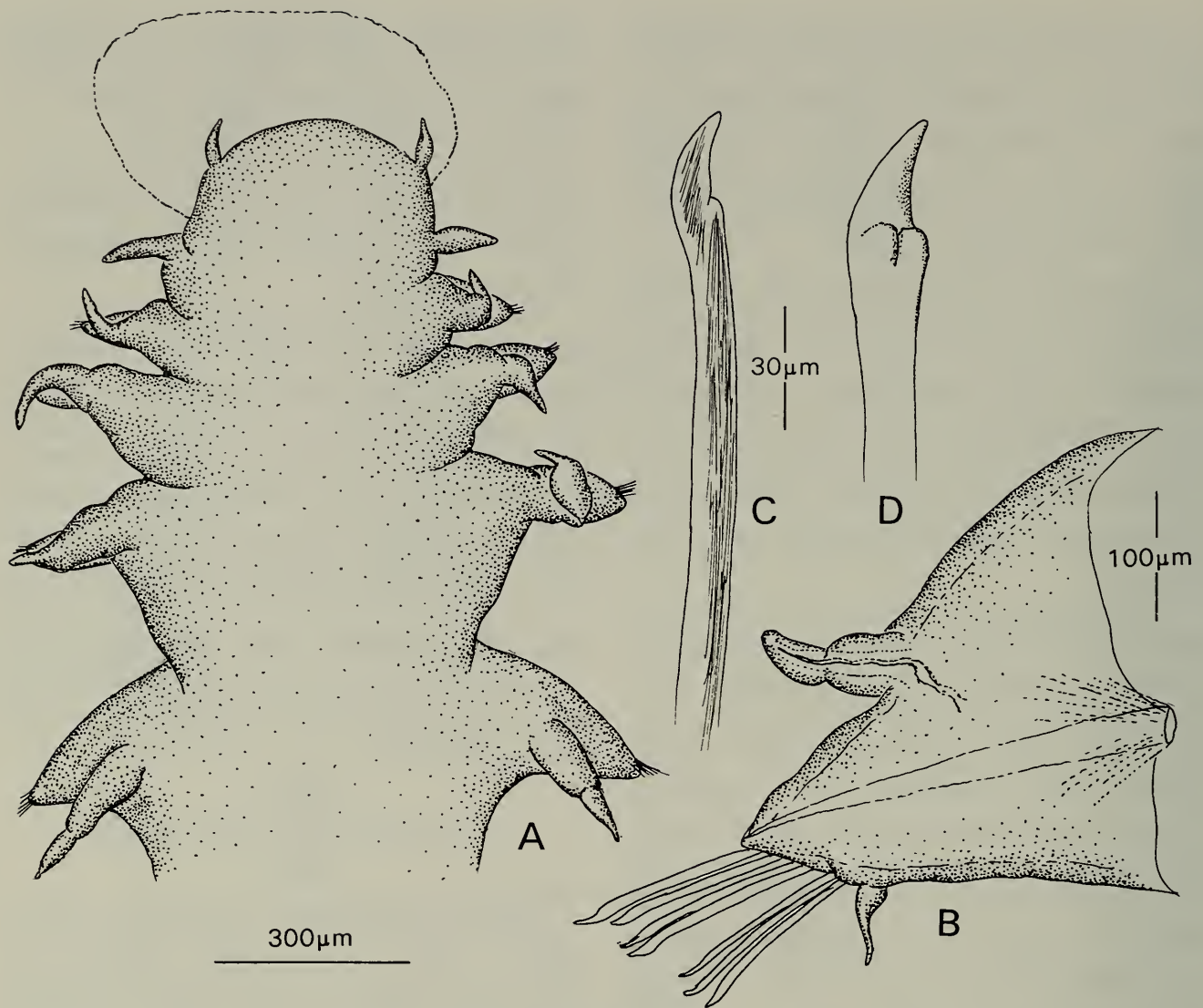


Fig. 4. *Flascarpia alvinae* (USNM 148679). A, anterior end, dorsal view (broken line indicates outline of everted pharynx); B, middle parapodium; C, D, neurosetae.

thickened, triangular, tapering to point; ventral cirrus short, cirriform. A single large internal acicula present and fascicle of 7–8 large protruding simple spines; each with curved tip and 2 thick subterminal protuberances (Fig. 4C–D). Pygidium a simple lobe.

Etymology.—This species is named for the DSRV *Alvin*, which was the vehicle used to collect specimens.

Remarks.—The habitat of *Flascarpia alvinae* is not known. It is likely, however, that this species is a commensal of bivalves and was washed from its host during the sorting process.

Discussion

The first published description of a nautiliniellid was by Miura & Laubier (1989), who described *Nautilina calyptogenicola* from a deep-sea vesicomid clam collected from the Japan Trench at a depth of 5960 m. This species was characterized by having two pairs of small antennae, short dorsal and ventral cirri, and a single, large protruding neuropodial hooked spine. The authors assigned this new genus to a new family, the Nautilinidae. In a subsequent paper, the same authors renamed the genus and family *Nautiliniella* and Nautiliniellidae,

because the earlier names were preoccupied in the Cephalopoda (Miura & Laubier 1990). In this same paper, the authors described two additional new genera and species: *Shinkai sagamiensis* Miura & Laubier from the bivalve, *Calyptogena soyoae*; and *Natsushima bifurcata* Miura & Laubier from *Solemya* sp. Both of these latter species were collected at the Hatsushima cold-seep site off Japan in depths of 1130–1170 m. The genus *Shinkai* was superficially similar to *Nautiliniella*, but differed in having up to eight hooks per neuropodium instead of one and in having only a single pair of antennae instead of two. *Natsushima* differed from the other two genera in having two types of neuropodial spines instead of one. Blake (1990) described another genus and species, *Petrecca thyasira*, from the mantle cavity of a thyasirid clam, *Thyasira insignis* collected from seep-like communities off Newfoundland at a depth of 3700 m. *Petrecca* differed from the previously described genera in having greatly elongated notopodia and an achaetous peristomial segment. Miura & Ohta (1991) described *Shinkai longipeda* from the mantle cavity of *Calyptogena* sp. collected at active hydrothermal vents in the Okinawa Trough in 1400 m. This species appears to be transitional between the genera *Shinkai* and *Petrecca* in the development of the notopodia.

The new taxa described in the present paper do not agree with any of the previously described genera. All have an achaetous peristomial segment with either small or well-developed tentacular cirri. *Miura* lacks antennae, has a thickened achaetous notopodial lobe, and a fascicle of small neuropodial spines. *Laubierus* has two small antennae, a long notopodial lobe with a large acicula, and both large and small types of neuropodial spines. *Flascarpia* has two antennae, two well-developed tentacular cirri, a reduced notopodium that may function as a gill, and a fascicle of heavy neuropodial spines. *Santelma* has three antennae, two

pairs of tentacular cirri, a single large protruding acicula and a fascicle of very fine bidentate setae.

The Nautiliniellidae now include eight genera, the characters of which are compared and contrasted in Table 1. The group is very heterogeneous and it is likely that the genera will need to be redefined and reorganized after additional species are discovered. In general, two distinct groups are apparent. One group lacks a peristomial segment and includes *Nautiliniella*, *Shinkai*, and *Natsushima*. The second group has a peristomial or achaetous segment and includes *Petrecca*, *Miura*, *Laubierus*, *Flascarpia*, and *Santelma*. Among the second group, the “peristomial segment” of *Petrecca* is actually a reduced setigerous segment that has a ventral cirrus and neuroacicula, but entirely lacks a notopodium. In *Laubierus*, the “peristomial segment” is also a reduced segment that bears a ventral cirrus, but no acicula. Thus, the presence or absence of a peristomial segment appears to depend upon the degree to which the first setiger is reduced and this undoubtedly contributes to the variability in this character that is exhibited by the different genera that have been described. All genera are characterized by having simple neuropodial spines, and except for *Santelma*, these setae are usually heavier and of a different form than those of the closely related family Pilargidae.

All of these new species are tentatively assigned to the Family Nautiliniellidae based on absence of notosetae, presence of simple spinous neurosetae, absence of anal cirri, and lack of palps. None of these species agrees with any genus of the Pilargidae although they appear to be closely related. The nautiliniellids are also related to *Antonbruunia viridis* Hartman & Boss (1965) from a bivalve dredged in the Mozambique Channel off Madagascar in 80–90 m. This genus and species was assigned to a separate family, the Antonbruunidae by Fauchald (1977) and to the Pilargidae by Salazar-Va-

Table 1.—Characteristics of the genera of the Nautiliicliidae and Antonbruunidae.

Character- istic	Antennae	Peristomial segment	Peristomial cirri	Notopodium	Noto- acicula	Neurosetae large	Neurosetae small	Proven- tritic	No. of spec- ies	Bivalve host	Reference
Genus											
<i>Nautiliiniella</i>	4, small	Absent	Absent	Short + dc ^a	Present	Present (1)	Absent	Present	1	<i>Calyptogena</i>	Miura & Lau- bier 1989
<i>Shinkai</i>	2, large	Absent	Absent	Short or elongate	Present (thin)	Present (3–8 ant) (1 post)	Absent	Present	2	<i>Calyptogena</i>	Miura & Lau- bier 1990; Miura & Ohta 1991
<i>Natsushima</i>	2, large	Absent	Absent	Short + long dc	Present (thin)	Present (2–4)	Present (bifid, many)	Present (weak)	1	<i>Solemya</i>	Miura & Lau- bier 1990
<i>Petrecca</i>	2, large	Present (achaetous seg)	Absent	Very long + short dc	Present	Present (1–2)	Absent	Present	1	<i>Thyasira</i>	Blake, 1990
<i>Miura</i>	Absent	Present	4, lobes	large, thick	Absent	Absent	Present (4–6)	Present (weak)	1	Unknown	This paper
<i>Laubierus</i>	2, small	Present (achaetous seg)	2, small	Long + short dc	Present, large tip protrudes	Present (2)	Present (15–20)	Present	1	Mussel ^b	This paper
<i>Flascarpia</i>	2, small	Present	2, large	Simple vas- cularized lobe ^c	Absent	Present (6–7)	Absent	?Absent	1	Unknown	This paper
<i>Santelma</i>	2, lateral; 1, medial	Present	4, small	?large	Present	Present (1, post segs only)	Present (many ant segs only)	?Absent	1	Unknown	This paper
<i>Antonbruunia</i>	5, large	Present	4, large	Long	Present	Absent	Present (many)	?Present	1	<i>Lucinia</i>	Hartman & Boss 1965; Miura & Laubier 1990

^a dc = dorsal cirrus.^b Preliminary identification: Seep Mytilid V-a (R. Luiz, pers. comm.).^c Lobe with blood loop, functioning as gill.

llejo (1986). The characteristics of *Antonbruunia* are compared with those of the various nautiliniellids in Table 1. The setal characteristics of *A. viridis* are more similar to those of the Nautiliniellidae than to the Pilargidae (See also Miura & Laubier 1990) and I prefer to follow Fauchald (1977) in placing *Antonbrunnia* in its own family.

All members of the Nautiliniellidae are believed to be associated with the mantle cavities of deep-sea bivalve molluscs. There is insufficient data to determine if the worms are commensals or parasites with the clams. Four nautiliniellid species are associated with bivalves at cold-seep communities (Miura & Laubier 1989, 1990; Blake 1990, this paper), while a fifth comes from a bivalve at an active hydrothermal vent (Miura & Ohta 1991). The Santa Maria Basin specimen was found in an upper slope sea valley at a depth of 565 m in an area of low dissolved oxygen. The specimen was not associated with a bivalve when it was sorted from the mud, but may have been washed from a bivalve in the same sample. The exact habitats of *Santelma miraseta* and *Flascarpia alvinae* are not known. Infestation rates of nautiliniellids in bivalves may be fairly high when the worms are present. For example, out of ten specimens of *Thyasira insignis* collected from off Newfoundland, five were found with a specimen of *Petrecca thyasira* (Blake 1990). These clams were each relatively small, ranging from 29 × 30 cm to 37 × 43 cm in width × length. The worms themselves were up to 16 mm long and thus occupied a considerable space among the gill filaments of the clams. Infestation data is not available for other species.

Acknowledgments

This study was funded in part by the Pacific Outer Continental Shelf Region of the Minerals Management Service (MMS), U.S. Department of the Interior, Washington, D.C. under Contract No. 14-35-0001-30484. The specimen of *Miura spinosa* was

collected as part of the MMS Phase II Monitoring Program in the Santa Maria Basin. The specimens of *Laubierus mucronatus* and *Flascarpia alvinae* were provided by Dr. Barbara Hecker, Lamont-Doherty Geological Observatory. The holotype of *Pilargis miraseta* was provided by Dr. Kirk Fitzhugh of the Los Angeles County Museum of Natural History (LACM-AHF). The manuscript was greatly improved by insightful comments provided by Dr. Chris Glasby and an anonymous reviewer.

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